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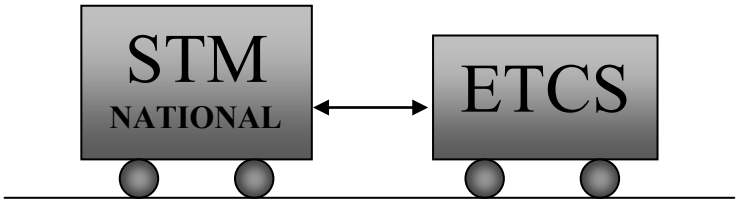
ATC2-STM

FUNCTIONAL REQUIREMENTS SPECIFICATION

with National & Additional Requirements



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Chapter 1:
INTRODUCTION

Contents

Contents lists of figures and tables: refer to the final chapter.

Document Modification History

Ver-sion	Modification	Valid from	Prepared	Approved
5.2	Changes – Updated according to *[Delta FRS v1.27]* – Figures & tables: fixed captions, see index – Blue marks added (also in unchanged text) to show differences between F-/A-requirements – Old Reserve-footnotes removed	7 Nov.2014	B Bryntse ÅF	
5.1	Changes – Updated according to *[Delta FRS v1.11]*	28 Oct. 2009	B Bryntse Teknogram	
5.0	Changes – Updated according to *[Delta FRS v0.46]* and *[Nationella krav i FRS GRS RAMS 0906.xls]* – Adjusted according to *[STM Granskning FRS 4.3 o 4.4_v0.5/_v0.3_ÖJ090626]* – National F-requirements & Notes: Mandatory. – Additional A-req's and A-notes (marked "A-info"). Replaces or extends corresponding national information. – Change marks since [FRS v4] with hidden text + index lists.	29.06.2009	B Bryntse Teknogram	
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4.0	National ATC2-STM, for approval by JBV, BV. Requirements in chapters 3, 4, 5 and 8: F3001..3336, F4001..4298, F5001..5059, F8001 Functionally changed requirements: **F3009**-10/13/19-29/32-33/38-39/48/51-52/54/56 /59/62-63/75/77-80/84/88/91/93/94A/96, F3101-04 /07-12/16-17/20-22/24/27/29-34/36-39/43/45-54 /58/62/67/73-77/83-84/89/91/93/99, F3204-06 /17 /20-25/27/30-33/38/48/52/56/57A/65/69/73/75/87 /94-95, F3305/07/09-10/24-33, **F4001**-02+A/07-08/14-18/20/22-32/34-35/38-41 /43-48/48A/49-50 /52-54/59-60/67-72/74-92/94, F4101-04/07-08 /17-19/21-24+A-F/27-33/36-37/39-40/42A/50/52-55 /61-64/66-67/69/71-72 /74-76 /77-78/82-83/85-86 /88/91/98+A /99A-H, F4200-01-03+A-B /04-05 /07-08/10/12-14 /18 /22-28 /28A-B/29/31-32 /34-98, **F5001**-10+A/23/27-59, **F8001:** BK-1b-2 /PT.1,3-4/RO/RK/H16/BP	09.02.2007	B Bryntse Teknogram	Ö Jonsson BV
3.0	European ATC2-STM version. For approval by JBV, BV.	24.6.2002	Ö Jonsson	S-H Nilsson

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1. CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

1.1.1 Scope

This document specifies how the national ATC2-STM system shall work together with the onboard ETCS to fulfil the ATC-2 requirements, including a number of improvements. [1]

This is a system working on the ETCS level **STM**. Under this level, the system is operating in the ETCS mode **STM National** (SN). During a mission in an ATC2-STM area, the active STM will be in the **Data Available** state (DA).

Starting up in ATC2-STM area

During the Start of mission procedure, the STM will pass through a number of STM states in which various functions are handled, like start tests and input of train data. If the system was started in an ATC2-STM area, the STM will take over by proceeding to the Data Available state (ordered by the ETCS, according to a previous driver input).

Starting up in another area

If the system was started in another ETCS area, the STM will stay passive in the Cold Standby state, while the ETCS or another STM is in charge.

Passing the border into an ATC2-STM area

When this train approaches the border to an ATC2-STM area, the STM will prepare for this by entering the Hot Standby state first, in which the reading of ATC-2 balises starts (but not the full speed supervision program). This prepares the STM before the take-over, by providing the STM with relevant information. At the border, the STM will take over by entering the Data Available state (controlled by ETCS), in which both balise reading and speed supervision functions are activated.

Running in ATC2-STM area

While the STM is in charge, it reads track information and supervises the train speed according to this information. The STM communicates with the driver via the DMI. Should the train pass a signal at stop or run too fast, the STM will intervene with full service or emergency braking. The ETCS works mainly as a train interface, but can also administer the passing into other types of ETCS areas (using other STM's or operating in another ETCS level).

[1] Since [ATC2]

1.1.1.1 Overview

This STM specification consists of the following parts:

Table 1.1-1. Document overview

Chapter [2]	Contents
1	INTRODUCTION
3	INFORMATION FLOW TRACK - TRAIN
4	SUPERVISION FUNCTIONS
5	AUXILIARY FUNCTIONS
8	TABLES

References to sections within a chapter are written in the format [sub-section number]. Example: [3.4.5.6].

References to the tables in chapter 8 are written as: [Table X].

The requirements are numbered according to the chapter number, starting at F3001 in chapter 3, at F4001 in chapter 4, and so on.

1.1.1.2 This document

This is an introductory chapter that explains how to read the others.

1.1.2 Document understanding

1.1.2.1 Requirements (normative)

The requirements are solely meant for the ATC2-STM.

Requirement types:

- F-requirements. Minimum functionality to be fulfilled.
- A-requirements. Alternate function to be fulfilled as an option to the related F-requirement.

[2] Corresponds to the chapters in the ATC-2 handbook [ATCH1].

Requirement text:

- Is preceded by a requirement number that begins with a letter.
- Contains the word “shall”
- May consist of several statements, numbered a), b), c) and so on
- Each statement may consist of several sub-statements, numbered 1, 2, 3 and so on
- May be followed by an included table (completely or partially). This must be directly referred to by the requirement
- Should only occur once in the FRS
- Differences between two related F- and A-requirements are marked with a light blue background colour in the beginning of every line or table row.

1.1.2.2 Explanations (non-normative)

This information is needed for clarification and shall not be regarded as requirements.

Informative text:

- Is preceded by the text “*Note*” but not by a requirement number
- Does not contain the word “shall”
- May follow directly after a requirement
- May duplicate a requirement in another sub-section.

1.1.2.3 Additional requirements (optional)

There are some additional functions that may be included in the STM. An additional function consists of one or more requirements with a requirement number that begins with the letter ‘A’. If the A-requirement is used, then the F-requirement with the same number is replaced and is not to be used. If an additional function is implemented all corresponding A-requirements should be used.

1.1.2.4 Requirement numbering method

When changing a requirement, it must be documented from which FRS version that it was changed.

- A changed requirement F1234 from FRS v5.N is to be given the complete number F1234.5Na.
- When a new F-requirement is added to FRS v5.N after F1234, it can be numbered for example A1234.5Nn or F1234A.5Nn.
- “a” and “n” are sequence numbers which are increased alphabetically (a-b-c etc, or n-o-p etc.) if more than one change has been discussed.

If different FRS versions documents exist as valid documents in parallel, for example FRS v5.N (Baseline 2) and v6.M (Baseline 3), special care must be taken if version 5.N has to be upgraded to version 5.N+1. If this upgraded FRS version contains changes in the same requirements as FRS v6.M, *it must be ensured that these requirements do not become identically numbered*.

1.1.3 Document References

1.1.3.1 ETCS documents

The following documents have been used as a basis for all notes and assumptions about the ETCS in this specification.

Table 1.1-2. ETCS documents

Short Name	Document Name	Edition	Subset
[EDMI]	STM DMI with Planning Area	A	--
[EMMI]	FIS for the Man Machine Interface	2.0.0	33
[ETI]	FIS Train Interface	2.0.0	34
[EFRS]	ERTMS/ETCS Functional Requirements Specification	4.29	–
[ESRS]	ERTMS/ETCS Class 1: UNISIG System Requirements Specification	2.3.0 [3]	26
[ESSRSS]	ERTMS/ETCS Class 1: UNISIG System Macro Function SSRS	2.0.0	30
[ESTM]	Specific Transmission Module FFFIS	2.1.1 [4]	35
[ESTMT]	STM FFFIS Safe Time Layer	2.2.0	56
[ESTML]	STM FFFIS Safe Link Layer	2.2.0	57
[ESTMA]	STM FFFIS Safe Application Layer	2.1.1	58
[ESTMP]	Performance Requirements for STMs	2.1.1	59
[ETC-2]	Test Cases, chaper 2	1.0.0	74
[ETP-5-2]	Test Plan, chapter 5-2	2.2.2	76
[ETP-6-3]	Test Plan, chapter 6-3	2.0.0	76
[ETP-7]	Test Plan, chapter 7	1.0.0	76
[TSIA]	Interoperability-related consolidation on TSI annex A documents	1.2.0	108

[3] Waiting for v3
[4] Later versions (2.x.x) are regarded as drafts

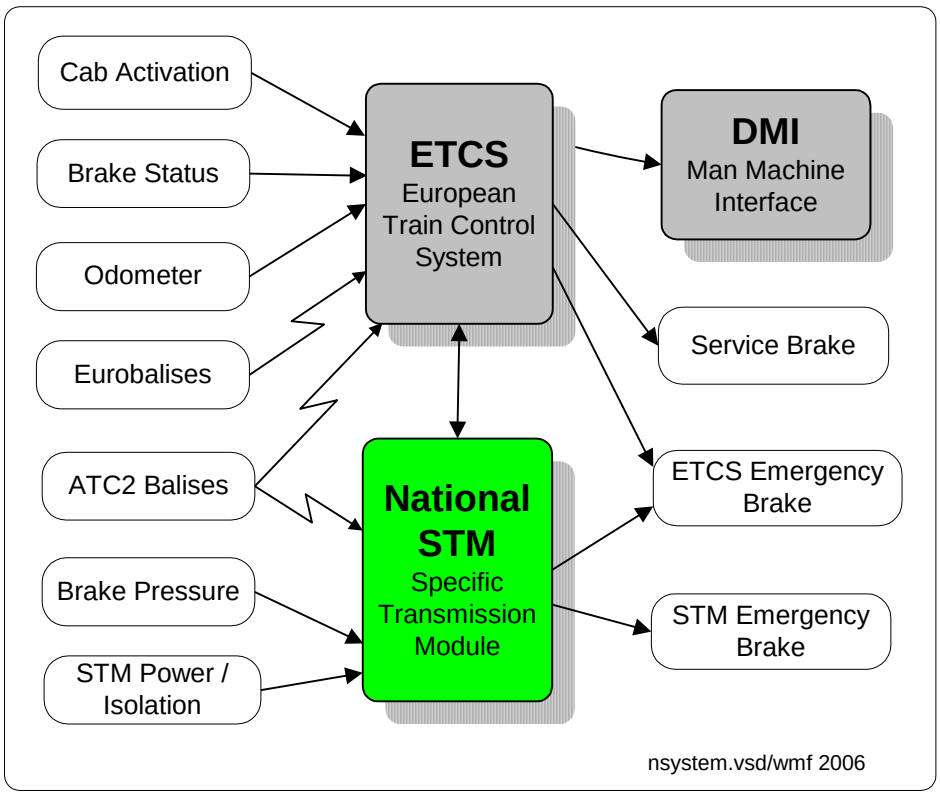
1.1.3.2 ATC-2 and ATC2-STM references

Table 1.1-3. ATC-2 and ATC2-STM references

Short Name	Document or System	Edition
[ATC2]	According to [ATC2A] and [ATC2B]	
[ATC2A]	Ansaldo's ATC-2 system, L10000	
[ATC2B]	Bombardier's ATC-2 system, Ebicab	
[ATCH]	ATC handbok, BVH 544.30000...30009 (2006)	1
[FRSE]	European ATC2-STM FRS, BVH 544.65001	3
[GRS]	National STM General Technical Requirements Specification, 100 200 E 004	5
[DFRS]	Delta FRS	1

1.1.4 System Overview

Figure 1.1-1. ATC2-STM System Overview



1.1.4.1 General description

The Swedish and Norwegian train control/protection system consists of the following onboard equipment:

– ETCS, European Train Control System (ERTMS-ETCS onboard).

– ATC2-STM, national Automatic Train Control equipment (also called the STM).

– DMI, Driver Machine Interface, a driver panel with buttons and indications.

– BTM, Balise Transmission Module, a transmission equipment which is a built-in part of either the ETCS or the ATC2-STM.

An engine may either use the same onboard equipment for both cabs, or use two equipments, one for each cab.

The ETCS and the STM onboard equipments shall cooperate with each other according to certain rules, as specified in this document. In ATC2-STM area (using the exisiting infrastructure), the system will work on the ETCS level **STM**. At this level, the ETCS mode **STM National** (SN) will be used.

The ATC2-STM main tasks are:

– Communication with the ETCS
– Driver communication via the driver's panel, the DMI
– Receiving train data via the ETCS and the DMI
– Interpretation of messages from ATC-2 balises
– Supervision of speed limits and braking curves
– Brake intervention when necessary
– Administer the Start of mission and End of mission procedures

Main tasks for ETCS in SN mode:

– System supervision
– Communication with the active STM
– Driver communication via the driver's panel, the DMI
– Receiving of ETCS train data via the DMI
– Provide the STM with train speed and odometer information
– Interpretation of eurobalises
– Handling of border passage into countries or areas for other ETCS levels

1.2 DEFINITIONS

1.2.1 System Conditions Overview

Table 1.2-1. Onboard System Conditions Overview

ETCS levels
0
STM
1
2
3

ETCS modes	
FS	Full Supervision
IS	Isolation
NL	Non Leading
NP	No Power
OS	On Sight
PT	Post Trip
RV	Reversing
SB	Stand By
SE	STM European
SF	System Failure
SH	Shunting
SL	Sleeping
SN	**STM National**
SR	Staff Responsible
TR	Trip
UN	Unfitted

STM states	
CO	Configuration
CS	Cold Standby
DA	**Data Available**
DE	Data Entry
FA	Failure
HS	Hot Standby
NP	No Power
PO	Power On

1.2.2 Definitions and explanations

Names on lamps, buttons and indications are indicated with capital letters.

Table 1.2-2. Definitions

Expression	Explanation
10-supervision	Expect stop with a release speed of 10 km/h
40-supervision	Expect stop with a release speed of 40 km/h
80-supervision	After balise error: expect stop with a release speed of 80 km/h, or using a max speed of 80 km/h
xx-supervision	Expect stop with a release speed of xx km/h
A-balise	The first compulsory balise of a balise group intended for the present direction. The B-balise is the second balise and so on
Acknowledge-ment	The driver is sometimes supposed to acknowledge by pressing a certain button
Adhesion	See “HALKA”

Expression	Explanation
A-extension	Extension of the target point from a distant signal (not Expect Stop) towards a switchpoint located beyond the next main signal (A-bortflyttning)
AFSK	Notification balise group for landslide warning (avisering)
A(n) balise	A-balise where AX = n
Annulled balise group	A balise group that is ignored (annullerad)
Annulling balise group	A balise group that cancels an already started supervision
Annulment	– Of a balise: The balise is ignored – Of a balise group: The group is completely ignored – Of a restriction: When an already started braking curve supervision is cancelled. An already started linking process is kept
Antenna	The vehicle antenna, which is used for reading passed balises. Mounted on the underside of the engine
Antenna switch	Unit that selects the correct antenna on engines with two antennas, depending on which cab that is activated
Area	– An STM area with a certain level of equipment regarding balises, as Fully or Partially equipped (physical area) – The STM view of the level of equipment which can differ from the physical area, if the train has started within the area or after balise error (STM area) (område)
ATC	Automatic Train Control
ATC-2	The ATC-2 system that is used today (year 2007), versions 2.1 or 2.2. Version 2.1 has radioblock functions. Version 2.2 contains also the "Öresund bridge" functions which allows trains to run between Sweden and Denmark [ATC2]
ATC2-STM	A national ATC-2 Special Transmission Module, specified in this document, that adapts the Swedish ATC-2 to the ETCS
AV1 - AV3	Notification balise for OTV, a level crossing warning board (avisering)
AX	The X-word of an A-balise (8 bits). A similar naming principle applies to BX, CX, PX, NX

Expression	Explanation
AY and AZ	The Y- and Z-words of an A-balise (8 bits each). A similar naming principle applies to BY, CY, PY, NY and BZ, CZ, PZ, NZ
AYZ	The combined YZ-word of an A-balise (16 bits). A similar naming principle applies to BYZ, CYZ, PYZ, NYZ
Balise	A transponder that is placed between the rails. When activated by a vehicle antenna it transmits information to a passing train. Functionally classed according to category, i.e. X-word, for example A(1), A(2), B(9).
Balise error	Error that is detected in connection to balise reading or when balises are missing, but also at some types of transmission errors.
Balise error alarm	A balise error has been detected and is indicated to the driver
Balise group	A group of balises (2...5) that belong to each other. The direction validity depends on the internal order of the balises
Basic speed	Speed restriction without exceeding, see “Exceed level”
Basic target distance	The part of the target distance that is given by the B-balise (and sometimes the C-balise). Gives the distance to the following main signal (or preset speed increase point).
Beginning balises	Balises at the beginning of a speed restriction (Börjanbaliser)
BF1, BF2 or BF3	Type of balise failure [3.3.4]
Bit	A binary digit; can only keep the values 0 or 1. Unit for a set of information. See also “byte”.
Bit error	Deviation from correct code (as Hamming code). One or more bits have gone incorrect, and the original code word can no longer be identified.
Blanking distance	The distance after a balise error of type BF3, during which the speed indications are kept extinguished (släckningsavstånd)
B(n) balise	B-balise where BX = n.
Braking curve	– Deceleration curve (distance/speed), shows how the train speed changes by the distance during braking – A certain set of data, that the program needs for administration of braking curves [4.9]
Brake handle	A handle used by the driver to control the braking of the train
Brake percentage	A number which, together with the train length, defines the braking capacity (deceleration) of the train (*Bromsprocent*)

Expression	Explanation
Brake position	Brake position (bromsgrupp) = R for passenger trains, P for normal freight trains (originally passenger trains) and G for heavy freight trains. Related to the brake delay time.
BROMS	Indicator, appears when the STM gives a braking order
BSK (BSKA)	Beginning of landslide warning section (annulled). (Början Skredvarningssträcka (Annullerad))
BTM	Balise Transmission Module. Onboard equipment to read trackside information
BU	Beginning of Installation area (Början ATC-arbetsområde, fd. Utbyggnadsområde)
Byte	A binary number (or set of data), containing 8 bits.
Cab status	Tells which cab that is active (or not) for the moment. See also “Direction controller”. Positions: A , B or None
Category	The balise category, which is the same as the X word value, indicates what kind of information that is given by this balise (signal, board etc).
Code error	A common expression for bit errors and incorrect combinations of code words
Cold Standby (CS)	A passive STM state, used in other ETCS levels than the ATC2-STM level (Låg beredskap)
Compulsory speed	A speed limit that is not allowed to be exceeded by any train (Tvingande)
Configuration (CO)	An STM state used during startup
Constant (data expression)	STM constants are values that are stored in a separate, easily replaceable type of memory, so that they can be easily changed
Controlling signal information	Main or distant signal information that affects a previously received OT-ET restriction
Data Available (DA)	An STM state used during normal operation in ATC2-STM area
Data Entry (DE)	An STM state for train data input
Deceleration	Train speed decrease per time unit, usually caused by braking. Is noted in m/s².
Deceleration curve	Full service braking curve, S_{DE} (retardationskurva)

Expression	Explanation
DMI	Unified Driver Machine Interface unit. Indicator and control panel for the ETCS system. Is placed at every desk (Förar-panel)
Direction con-troller	A handle used by the driver to control the direction of movement (positions Forward / Neutral / Reverse).
Direction of movement	A movement of the train, forwards or backwards
DISTANCE BAR	Shows remaining target distance (avståndstermometer)
Distant signal	A balise group that transmits a distant signal message.
D_{REL}	Release distance, the distance between the release and target points
D_{TARG}	Target distance from a distant signal or a warning speed board, or a target distance in a braking curve.
EBI (ETCS)	Emergency Brake Intervention (curve)
Emergency brake curve	Curve S_{EF}, located two seconds after the deceleration curve S_{DE} (nödbromskurva)
Engine	Here: a vehicle equipped with ETCS and ATC2-STM
EP brake	Electro Pneumatic brake, an electrically controlled brake system (EP-broms)
ET	Route dependent speed restriction category, primarily intended for temporary speed restrictions (Extra Tvingande nedsättning)
ETCS	Here: The onboard European Train Control System equipment, ERTMS/ETCS
ETCS max speed	ETCS max speed parameter of the train, V_{ETCS} (Sth)
ETCS with ATC2-STM	Automatic train protection system with ETCS and STMs. Consists of: – The Norwegian/Swedish onboard train protection equipment, with ETCS + ATC2-STM units. – The track, equipped mainly by ATC-2 balises, but eurobalises can also be used.
ETG	Route dependent speed restriction for a diverging route (Extra Tvingande, Grenspår)
ETR	Route dependent speed restriction for a straight route (Extra Tvingande, Rakspår)
ETxF	Distant signal controlled ETx

Expression	Explanation
ETxH	Main signal controlled ETx
Exceed level	Exceeding (överskridande) in percent of normally valid speed restrictions in curves. May only be used by certain trains. See “K1” and “K2”.
Extension	Lengthening of target distance by an additional distance (also called deferment). The extension distance is added to the basic target distance (bortflyttning)
Extension distance	The part of the target distance that is given by a P-balise belonging to a signal group (bortflyttningsavstånd)
f2 tone	An audible signal that informs or warns the driver of changes
Failure state (FA)	STM state after system failure
FEL	This text starts flashing on the MAIN INDICATOR after balise error with 80-supervision
Fixed braking curve	When a main signal is passed, the remaining target distance of an extended Fsi braking curve is set equal to the extension distance, with the main signal as starting point.
Flashing interval	Interval B, in which the MAIN INDICATOR starts flashing (blinkintervall) [4.9]
Fsi	Distant signal (försignal)
FSK (FSKA)	Warning board for landslide warning section (annulled). (Försignal Skredvarning (annullerad))
G	Speed restriction category, for areas with reduced supervision
GMD	Border to Partially equipped area (Gräns Mot Delvis utrustat område)
GMO	Border to Non-equipped area (Gräns Mot Outrustat område).
GR	Track gradient in ‰.
HALKA	Set by the driver to Off (high adhesion) or On (low adhesion). Indicates whether the STM shall use full braking (Off) or soft braking (On) in its braking curve calculation.
Hamming code	Code that is made according to the theories of R.W. Hamming. The code contains redundancy, so that an error in a number of bit positions can be discovered. Single bit errors can be corrected, but are almost never corrected by the STM, by safety reasons.
Hamming distance	The smallest number of bits that have to be changed in a code word (belonging to a group of code words) so that a new, valid code word is created (in the same group). Hamming distance 4 is used for ATC-2 balises.

Expression	Explanation
Hot Standby (HS)	An STM state in which the STM must be prepared to become activated (Hög beredskap)
Hsi	Main signal (HuvudSignal).
HT	Speed board balise group (HastighetsTavla).
HT-T, HT-K1 etc	Speed board balise group of category T, K1 etc
HÖJNING	Button to control (finish or increase): – Semi-equipped restrictions. – Start speeds and dark speeds.
Increased speed	The new (increased) max speed that shall be supervised when the train has reached an increase point, and also (in most cases) passed this point by its whole length
Indicator	Indicator on the DMI, shows a text or an icon
Indication limit (ETCS)	When this limit is reached, bar colours will change (yellow)
Information point	Balise group
Information tone	A short f2 tone of 0.5 s duration
Installation area	An area where the ATC-2 track layout is under construction. The area is delimited by special balises (BU + SU) that passivates and activates the speed supervision of passing trains. (ATC-arbetsområde)
Interval	Current braking curve interval A, Ab, Bf, B, C, D, E or F according to the specified rules and speed limits (intervall) [4.9]
Interval, computed	Computed braking curve interval A, Bf, B, C, D, E or F, all the way down to the target speed [4.9]
Interval, physical	Physical braking curve interval A, Bf, B, C, D, E or F, down to the respective speed limit [4.9]
K1	Curve 1 category, restriction at a normal curve. May be exceeded according to the train parameter K1
K2	Curve 2 category, restriction at a curve with an unusual entry curve. May be exceeded according to the train parameter K2
Leading engine	Here: The first vehicle of a train, where the driver is
Level	ETCS operation level (area), can be 0, 1, 2, 3 or STM
Linking	A function to ensure the presence of expected signal or board balise groups. If a group is missing, balise error will occur

Expression	Explanation
Linking distance	Distance from a balise group to another point, before which a new balise group is expected
Linking group	Balise group with signal distance information update. Is normally fixed coded. Both AY and AZ are 14 (= no main or distant signal information)
Loco identifier	A replaceable piece of memory which tells the STM what kind of train this is (ID-plugg)
Locked	A locked braking curve (OT-ET or extended Fsi) can not be updated by a repeater anymore
LOSS	Button to release an STM braking
M	Marker. Also written (M).
MAIN INDICATOR	Digital indicator for display of max speed or target speed (H-indikator)
Main signal	Balise group giving a main signal message
Marker	A non-coded balise.
Max speed	See “Maximum permitted speed”
MAX SPEED BAR	An arc-shaped indication that shows the max speed on the speed dial. (Also called Permitted speed bar), (Takhastighetsbåge)
Maximum permitted speed	The valid, general permitted train speed (gällande takhastighet), depending on the max speed of the train, the track condition (speed boards), switchpoint positions (signals), and similar. May be increased according to a K1 or K2 exceed level [4.5]
Memory	Some sort of computer memory, that may contain data
Miscellaneous board	Balise group, where the A-balise is of category 5. (Does not necessarily mean that there really is a physical board too.) May inform about speed restrictions, landslide warning, signal speed increase, borders etc.
Mode (ETCS)	ETCS operation mode, here: usually STM National
MRSP (ETCS)	ETCS’ Most Restrictive Speed Profile. A description of the most restrictive speed restrictions that the train shall obey on every section of track. Can be used to update the planning area
National values (ETCS)	Information given from ERTMS trackside, such as certain speed and time limits that are obeyed by the ETCS. Not used with a national STM

Expression	Explanation
N-balise	Signal number balise, AX=12 (signalnummerbalis). Has no function for the STM except for identification of warning board repeaters
Odo_Nom (ETCS)	The nominal ETCS odometer. Used by the STM to find out when a certain point is reached
Odometer (ETCS)	The never-stopping distance counter, received from the ETCS. Contains min, max and nominal values. Only the nominal value Odo_Nom is used by the STM
OT	Warning board balise group for a speed restriction or a level crossing (V1..V3) or landslide protection (SK) (Orienterings-Tavla).
OTG	Warning board balise group for a coming border group, see also ”V_{OTG}” (Orienteringstavla för Gränsbalis)
Opposite direction	Expression used for balise groups that are intended for the opposite direction of movement (motriktade)
Overspeed	When the train runs too fast, and its speed exceeds the maximum permitted speed (överhastighet).
P-balise	A prefix balise, placed before the A-balise when used. Gives distant signal extension distance, or OT/HT detailed restriction category (prefixbalis).
P-extension	Extension of target point from a distant signal (usually Expect Stop) past one or more main signals, so that the total target distance covers several block sections (P-bortflyttning)
Permitted curve	A curve that defines the indicated, descending max speed during deceleration supervision. Located inside interval B. Does not affect the supervision
P_{FULL}	Cylinder pressure when full service braking is applied
P_{INT}	The internal representation of brake feedback [5.2]
Point of preset speed increase	Speed increase at a switchpoint. The main signal speed V_{HSI} is increased at a point where there are no balises, but which is aimed at by a preceding, combined signal. See also “Preset speed increase” (utpekad höjningspunkt)
Power Off (NP)	An STM state that applies when the power is turned off (Avstängd)
Power On (PO)	An STM state that applies when the power is turned on (Påslagen)
PRE INDICATOR	Digital indicator for early display of target speed (F-indikator)

Expression	Explanation
Pre-flashing interval	Interval Bf, in which the PRE INDICATOR starts flashing (förblinkintervall) [4.9]
Prefix balise	P-balise with extension distance or PT code
Present direction	Expression used for balise groups that are intended for the train's current direction of movement (medriktade).
Preset speed increase	A coming, “distant-signalled” speed increase, received from a combined signal group. See also ”Point of preset speed increase” (utpekad höjning)
PT	Train dependent speed category, uses prefix balise P(8). There are nine sub-categories, octally written as 000...777 [Tables PT.1-4]
PTNA	Annulment of restriction with prefix balise (OT or HT)
Record	A collection of data variables, belonging to a certain item (e.g. a braking curve)
Redundancy	Doubling of units or information for safety or reliability reasons.
Reference location (ETCS)	Examples: the saved nominal odometer value (Odo_Nom) for the A-balise of a present-directed distant signal or warning board group
Register	An old-fashioned expression for a data variable, that may contain a speed or distance value, for example
Release distance	“Release distance” after passing a distant signal at Expect Stop: – Overlap: Before the train has stopped, this is a time limited protection distance. – Distance to DP: After the train has stopped, this is the distance left to the danger point (DP).
Release group	A balise group that updates the distant signal release speed
Release point	The release speed is supervised as a max speed from this point. Used in deceleration supervision of an Expect Stop braking curve from a distant signal or warning board. (Knäpunkt (Fsi) / Ö-punkt (OTV/FSK))
Release speed	Speed at which the deceleration supervision ceases. Used only when the target speed is Expect Stop from a distant signal or warning board (level crossing or landslide protection). Usually 10 or 40 km/h. (Frisläppningshastighet (Fsi) / Övervakningshastighet (OTV/FSK))

Expression	Explanation
RELEASE SPEED BAR	Analog arc-shaped indicator for display of release speed on the speed dial (frisläppningsbåge)
Repeater distant signal	A distant signal balise group that updates an existing distant signal braking curve
Repeater warning board	Warning board balise group that uppdates an existing warning board braking curve
Resting (cab)	A condition where the equipment is completely passive, and there is no supervision, balise reading or display. Only certain internal system functions are checked. Caused by cab de-activation [4.3.13]
Restriction	A section where the permitted speed is reduced, compared to the surrounding line.
Reversing	A movement opposite to the established travel direction.
Rfsi	Repeater distant signal
S0 - S13	Secondary control outputs for future use, external functions in the train. Given by special balise codes in miscellaneous boards (sekundära styrutgångar)
S-balise	Balise, in which one or more words can be controlled externally (styrbar balis)
Semi-equipped restriction	Speed restriction with balises only at the warning board (halvutrustad nedsättning, "knapptryckare").
SBI (ETCS)	Service Brake Intervention
Service brake intervention curve	During deceleration supervision: a curve S_{CD} that precedes the deceleration curve. Tells where full service braking shall be initiated (insatskurva för driftbroms).
SET	End of ET restriction. Terminates a restriction that started at HT-ET. (Slut på ET-nedsättning)
SH group	A miscellaneous board that increases the valid main signal speed and adjusts the target distance of the current distant signal braking curve at the same time
SIG	Main signal information (can be erased at balise error)
Signal aspect	What the physical signal shows (Stop, Proceed etc), which corresponds to the information given by the signal balise group
Signal number	Identity of a passed signal, SH group or warning board. The signal number is transmitted in an extra balise of category 12 and is encoded in H(16,11). Reserve function (radio), but influences the way a warning board is repeated

Expression	Explanation
SK	Landslide protection speed category (SKred)
SK1 - SK2	End of curve restriction (Slut på Kurvbetingad nedsättning).
Soft braking curve	A braking curve computed for low adhesion, when the driver has selected HALKA (mjuk övervakning)
Speed bars	Analog, coloured arc-shaped bars that displays speed information on the speed dial of the DMI: MAX SPEED BAR + TARGET SPEED BAR + RELEASE SPEED BAR (takhastighetsbåge + målhastighetsbåge + frisläppningsbåge)
Speed board	Balise group with a message related to a real or a fictitious speed board, or to a level crossing or landslide protection
Speed dial	A circle-formed indicator on which analog speeds can be displayed on the DMI (hastighetsmätare)
Speed indicators	Digital speed indicators on the DMI: PRE INDICATOR + MAIN INDICATOR (för- och huvudindikator)
Speed pointer	Shows current train speed on the speed dial of the DMI (hastighetsvisare)
SPTS	Selective end of PT-restriction (only HT). (Selektivt slut på PT-nedsättning).
SPTT	End of all PT-restrictions (Slut på alla PT-nedsättningar).
SSK	End of landslide warning restriction (Slut på SKred-varningssträcka.)
SSP (ETCS)	Static Speed Profile (which may affect the Planning area)
Start of Mission (ETCS)	A procedure which makes the ETCS system (and its STM's) ready to go
Startup	A procedure which makes the STM ready to go
State	STM operational state (driftläge)
Sth	A Swedish abbreviation related to the general max speed of the train, Största tillåtna hastighet
STM	Specific Transmission Module. Here: the ATC2-STM unit that supervises speed and communicates with the ETCS
STM brake	Brake order from the ATC2-STM onboard equipment
STM failure	Operational disturbance in the on-board ATC2-STM system
STM max speed	An STM max speed parameter, V_{STM}, which depends on block length and braking characteristics of the train. Can be changed during the mission. See also "ETCS max speed".

Expression	Explanation
STM Shunting	A sub-state to Data Available, in which the STM permits the train to pass stop signals. Initiated by the driver
SU	End of Installation area (Slut ATC-arbetsområde / Utbyggnadsområde).
SV1 - SV3	End of level crossing restriction (Slut på nedsättning vid Vägkorsning).
Synchronization	Method to indentify the beginning and end of a message in a serial data flow
T	Line speed category, a compulsory max speed (Tvingande).
Target distance	Distance to the target point of a braking curve (or to the point of preset speed increase). Consists of a basic target distance but is sometimes prolonged by an extension distance (mål-avstånd)
Target point	The point where the target speed of a braking curve is changed to a max speed and supervised as such (målpunkt). Exception: after Expect Stop, the release speed will be used.
Target speed	The speed to which the train shall slow down after braking. Can be given at distant signals and warning boards. May be increased according to a K1 or K2 exceed level (målhastighet)
TARGET SPEED BAR	Analog arc-shaped indicator which shows coming restrictions on the DMI (målhastighetsbåge)
Target window	A distance that covers the target point with 80...120 % of the OT target distance aiming at this point. Lowest value ±12 m (målpunktsfönster)
TBD	To Be Defined
Telegram	Consists of a by the onboard equipment received message (data bits) plus a synchronization word.
Termination	a) Of a braking curve: when the braking curve is erased b) Of a restriction: when the restriction is erased.
Train	One or more trackborne vehicles, where at least the leading one (the engine) is equipped with ETCS and STM units
Train data	Information about the train, entered by the driver (or preset in some type of computer memory)
Train data input	When the train data is entered to the onboard system by the driver
Train length (ETCS)	The length of the train. Belongs to ETCS train data.

Expression	Explanation
Train length delay	A function which holds back a speed increase until the whole train has passed the end of a speed restriction.
Train parameters	See “Train data”
Travel direction	A defined direction of movement, usually the one that the train shall have to its destination.
V_{DARK}	Max speed used in "dark" areas where there is none or limited display, such as Non-equipped area
V_{FSI}	Distant signal speed from a signal balise group (försignal-hastighet)
V_{HSI}	Main signal speed from a signal, SH or speed board group (huvudsignalhastighet)
V_{HT}	Maximum speed from a speed board balise group
V_{MAX}	Maximum permitted speed in general (gällande takhastighet), see also “Max speed”
V_{OTG}	Target speed or max speed given by an OTG balise. Is changed from target to max speed when a border balise group is passed.
V_{REL}	Release speed (frisläppningshastighet / Ö-hastighet)
$V_{REVERSE}$	Max speed limit which applies while the train is reversing
V_{SEMI}	Max speed for a semi-equipped speed restriction
V_{START}	Speed limit used after Start of Mission and after shunting
V_{STH}	Maximum permitted speed of the train. Is entered as train data. This refers to the STM max speed. (Sth = Största Tillåtna Hastighet).
V_{TARG}	Target speed from distant signal or warning board or in a braking curve (målhastighet)
V_{TRAIN} (ETCS)	The current train or vehicle speed, computed by the ETCS
V1 - V3	Level crossing speed categories. Supervision for faulty level crossings
VÄXLING (indicator)	Indicator which shows that the ATC is in STM Shunting state.
VÄXLING (button)	Button, used to enter STM shunting
Warning board	A balise group that gives a message for a real or a fictitious warning speed board, or for a level crossing or land slide protection

Expression	**Explanation**
Warning limit (ETCS)	When this limit is reached, bar colours will change to a warning colour (orange).
Warning tone	A short f2 tone of 0.3 s duration
YZ word	The Y and Z balise words used together as one 16-bit word

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1.3 NATIONAL STM

Major changes that were introduced when the former european ATC2-STM was changed to a national ATC2-STM, or advantages with the national ATC2-STM:

- The STM does not have to give the ETCS any movement authority, static speed profile, gradient information or reference location messages. [1)]
- The STM does not have to perform a number of complicated tasks to prevent unnecessary ETCS emergency braking in connection with passing of signals (EOA, LOA). [2)]
- The STM supervises every speed restriction and braking curve [2)]
- The STM can set its own overspeed limits for STM brake intervention, which do not have to be as restrictive as the ETCS speed margins [5)]
- The STM decides when a brake intervention is needed (or not). [2)]
- The STM determines which max speed or target speed that is indicated (or not) [2)]
- Digital speed indicators: [4)]
  - Indication of more than one braking curve is now possible
  - For level crossings, the indication can now be inhibited until they are relevant
  - Suitable indications in different STM areas or conditions
  - Distinguishing certain target speeds from others (distance extensions, level crossings)
  - Indication of when the release point has been passed
- Planning area [4)]
- Compensation for track gradients according to national rules [2)]
- Expect stop: Release speeds and release points can now be supervised according to national rules and speed margins [2)]
- The ETCS national values are not needed (restricting) anymore. Example: emergency braking can now be released before the train has stopped (if admitted by the national rules). [2)]
- National STM train data for the braking capacity of the train are not so restrictive as the corresponding european ETCS train data [5)]
- The ATC2-STM system can measure brake pressure, which means that:
  - The STM braking functions can be checked [3)]
  - The brake pressure value can be used to find out if the driver is braking, which delays the brake intervention curve [5)]

Explanations:

1) This makes the system more robust
2) Decreased risk of unnecessary brake intervention
3) Increased safety
4) More information to the driver
5) Increased track capacity

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1.4 INDEX

1.4.1 Changes, figures and tables

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